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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/840,600	04/23/2001	Roger S. Tsai	12-1120	3792

7590 07/01/2003  
Patent, Counsel  
TRW, Inc.  
Law Department  
One Space Park, Building E2/6051  
Redondo Beach, CA 90278

EXAMINER

TRAN, THIEN F

ART UNIT PAPER NUMBER

2811

DATE MAILED: 07/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/840,600

Applicant(s)

TSAI, ROGER S.

Examiner

Thien Tran

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 4-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13-15 is/are allowed.
- 6) ☒ Claim(s) 1,5-12,16,18 and 19 is/are rejected.
- 7) ☒ Claim(s) 4 and 17 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |                                                                                              |                                                                             |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                             | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____.  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____. | 6) <input type="checkbox"/> Other: _____.                                   |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 6-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 6-7 recite the limitation "step (d)" in line 1. There is insufficient antecedent basis for this limitation in the claims.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5-7, 16, 18 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Mahon et al. ("A Technique for Modelling S-Parameters for HEMT Structures as a Function of Gate Bias", IEEE Transactions on Microwave Theory and Techniques, Vol. 40, No.7, July 1992).

Mahon et al. disclose the claimed method of modeling a semiconductor device comprising the steps of modeling a small signal electrical equivalent circuit (Fig. 1) for the semiconductor device (HEMT device) which includes a plurality of electrical circuit elements defining a small signal model, said small signal equivalent circuit based in part

Art Unit: 2811

on physical gate length and wafer structure such as doping densities which the examiner characterizes as real process parameters; and deriving the electrical circuit elements at least in part from a small signal excitation analysis of at least electrical field characteristics of the semiconductor device (see pages 1431 and 1433).

Regarding claim 5, Mahon further discloses the step of determining the relationships between conduction band and electrical permitivities and the material composition for the materials in the semiconductor device (see page 1431).

Regarding claim 6, Mahon et al. discloses analytically determining the relationships between the electrical permitivity, conduction band and material composition.

Regarding claim 7, Mahon et al. further discloses the step of fitting simulated data.

Regarding claim 16, said semiconductor device model is based at least in part as a function of one or more of conduction band offsets; electrical permitivities; and material composition of the wafer structure.

Regarding claim 18, said semiconductor device is a HEMT.

Regarding claim 19, said semiconductor device is a FET.

Claims 8-12 rejected under 35 U.S.C. 103(a) as being unpatentable over Mahon et al. in view of Hirose et al. (A Possible Scaling Limit for Enhancement-Mode GaAs MESFET's in DCFL Circuits", IEEE Transactions on Electron Devices, Vol. 39, No. 12, Dec. 1992).

Mahon et al. as described above does not specifically disclose determining the electron transport characteristics of any bulk materials in the semiconductor, determining the undepleted linear channel mobility by material characterization or physical simulation, and determining the schottky barrier height expressions. However, such determinations are known in the art for modeling HEMT device as disclosed for example by Hirose et al. (sections II and III). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to further include the steps of determining the electron transport characteristics of any bulk materials in the semiconductor, determining the undepleted linear channel mobility by material characterization or physical simulation, and determining the schottky barrier height expressions as taught by Hirose et al. into the method of Mahon et al. in order to achieve higher speeds.

***Allowable Subject Matter***

Claims 13-15 are allowed.

Claims 4, 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Prior art references do not teach or render obvious a method of modeling a semiconductor device wherein real process parameters include at least one of gate length recess, etch depth, recess undercut dimensions and passivation nitride thickness.

Art Unit: 2811

Prior art references do not teach or render obvious a method of modeling a semiconductor device comprising the steps of forming semiconductor physical equations with empirical terms for modeling one or more of the following characteristics fundamental charge control physics for sheet charge in an active channel as controlled by a gate terminal voltage; average centroid position of the sheet charge within the active channel width; position of charge partitioning boundaries as a function of gate, drain and source terminal voltages; bias dependence of linear channel mobility and surface depleted regions; bias dependence of a velocity saturating electric field of the channel; saturated electron velocity; electrical conductance within the linear region of the channel, under the gate; electrical conductance within the source and drain access regions.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1, 5-12, 16 and 18-19 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

Art Unit: 2811

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien Tran whose telephone number is (703) 308-4108. The examiner can normally be reached on 8:30AM - 5:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

tt  
June 26, 2003



Thien Tran  
Patent Examiner  
Technology Center 2800